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ABSTRACT

Vocational education has many pedagogical advantages over academic education in meeting three critical conditions of excellence. The first critical condition is student involvement. Most vocational education programs tend to involve students intensely and personally with peers and teachers. The natural advantage most vocational education has over academic education is that much of it consists of problem solving, a form of active learning. Both vocational and academic students must be able to analyze, synthesize, and evaluate information. The second critical condition is feedback between the teacher, the student, and the institution. An advantage that vocational education has in this area is that it develops the student's ability to perform a given procedure, which is usually observable, assessable, and indicative of whether students can apply their learning. Classroom research, such as "minute papers" and self-diagnostic learning logs provide feedback and require students to engage in the higher-level learning activities of synthesis, application, and evaluation. The third critical condition is high standards. Education at all levels is often criticized for its lack of standards and high expectations. Vocational educators have a pedagogical plus in the form of external licensing procedures that sometimes exist and in advisory committees, which can provide an outside check on the quality of student performance. (Contains 11 references.) (CML)

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PEDAGOGICAL PLUSES IN VOCATIONAL EDUCATION

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PEDAGOGICAL PLUSES IN VOCATIONAL EDUCATION

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I've entitled my remarks today, "Pedagogical Pluses in Vocational Education" because I believe that recent research on teaching and learning is more likely to be applied in vocational education than in the academic curriculum. I say that, not to flatter you, but to urge you to recognize and capitalize on the pedagogical advantages of vocational education. In today's rhetoric about "educational excellence," we are all too likely to slip into the error of equating educational excellence with academic excellence. Excellence in vocational education is your goal, I assume, but it is frequently neglected in discussions about quality in education.

The current wave of national attention to excellence in education was kicked off by the appearance of a small but potent report, entitled "A Nation at Risk," which got newspapers, television, and ultimately the public riled up about the "rising tide of mediocrity" which was washing through the public schools. "Our once-challenged preeminence in commerce, industry, science, and technological innovation" proclaimed the report, "is being overtaken by competitors throughout the world," -- thus placing our nation at risk (National Commission on Excellence in Education, 1983).

As a nation, we have been searching diligently for educational excellence and the strategies, policies, and practices that will make our students competitive in educational accomplishments with those from other countries. Millions of dollars are poured into research each year in a serious attempt to increase our understanding of teaching and learning. As I was reviewing some of this research recently, it occurred to me that many of the pedagogical practices that are showing up in research as most useful and effective, are present in large measure in vocational education. Indeed, pedagogically speaking,

vocational education has many advantages that must be artificially created in academic learning.

Unfortunately, many vocational educators fail to take advantage of the performance-orientation of vocational education, and the teaching methods of some vocational educators are virtually indistinguishable from those of their colleagues in more abstract academic fields. One recent study, for example, found 12 percent of the full-time transfer faculty in community colleges preferring the lecture style of teaching, but 11 percent of the full-time occupational/technical faculty also preferred to lecture most of the time (Keim, 1989). Lectures, as a steady diet for community college students, don't have many pedagogical pluses, whether used by academic or vocational teachers.

I am going to argue that the route to excellence in our times lies in taking the best from vocational education and the best from academic education and moving both toward the goal of preparing students for lifelong learning. From a **pedagogical** perspective, most of the advantages lie with vocational education -- a factor unrecognized and undervalued by vocational educators as well as by others. From the perspective of assuring that students have the basic communication skills so essential for lifelong learning, most of the advantages lie with academic learning, -- if by "academic learning" we mean school-learned skills such as reading, writing, and arithmetic, and other skills that enable people to continue to learn new things as needed throughout their lives. I suspect that values, ethics, self-esteem, problem solving, critical analysis, sensitivity and other characteristics that we like to think are the outcomes of an excellent education are equally accessible to vocational education and to academic education.

Shortly after the appearance of "A Nation at Risk," which sought to improve elementary and secondary education, some of the nation's top researchers in postsecondary education issued their own report on educational excellence, which they entitled Involvement in Learning (Study Group on the Conditions of Excellence in American Higher Education, 1984). In that report, the researchers distilled and highlighted what

modern research has to say about effective teaching and learning. In a nutshell, they concluded that there are are three "critical conditions of excellence." They are: 1) student involvement, 2) assessment and feedback, and 3) high expectations. All three of those conditions of excellence are built into vocational education -- but the pedagogical advantages of vocational education will not result in excellence without attention, cultivation, and articulation on the part of vocational educators. So, for the next half hour or so, I'd like to focus your attention on excellence in vocational education by using the three critical conditions for excellence as a framework for reviewing some recent research on teaching and learning.

Student Involvement:

Student involvement is defined as "the amount of time, energy, and effort students devote to the learning process" [Study Group, 1984, p. 17]. There is nothing especially surprising about the research finding that the more time and effort students put into learning, the more they will learn. The best teachers in the world cannot improve learning without effort on the part of students. Perhaps the more interesting findings from the research are that students who get involved with the people and organizations associated with education show greater growth and achievement, greater satisfaction, higher retention, and greater participation in further learning opportunities than those who participate only in classroom learning experiences (Astin, 1983).

Indeed, one of the reasons that residential colleges have higher retention rates than community colleges is that residential colleges, have many more ways of involving students with the people and organizations of the college. Students are a captive audience on a residential campus, spending work time as well as leisure time on campus, socializing with fellow students in the dorms, joining organizations that involve them with others sharing their interests, talking and working with faculty. The research shows that, when it

comes to retention, even working at a part-time job on campus has a significant advantage over working off campus (Astin, 1983).

While community colleges and voc/tech institutions can never claim the same kinds of on-campus involvement as residential colleges, vocational programs have many of these advantages -- advantages not shared by academic programs on commuter campuses. By their very nature, vocational programs usually involve students in collaborative learning. Students frequently work with partners or in teams in which they come to form associations around a common task that eludes students sitting next to each other in an English class. Furthermore, the relationship between faculty and students in vocational programs is usually less formal and more personal. Personal attention can be given to the student having trouble wiring the circuit correctly in a way that is not possible for the history teacher who may not even be aware that a student is having trouble grasping the significance of the Battle of Bunker Hill.

So, one pedagogical advantage of most vocational education programs is that they tend to involve students intensely and personally with peers and teachers. It is difficult for a student in nursing to remain anonymous and unknown by fellow students and teachers.

A second dimension of student involvement is frequently referred to in the literature today as "active" learning. I am not referring here so much to the physical hands-on activity that is typical of many forms of vocational education as to the mental activity that comes from active involvement in the learning task. There is now a large body of research about the use of learning time. Observers in school classrooms have clocked enormous variations from classroom to classroom in the time that students spend actively engaged in the learning task. It varies from as little as 50 percent of class time devoted to active learning, to as much as 90 percent (Fisher & Others, 1978). Thus, in a school year, some students spend almost twice as much time as others actively engaged in learning.

But researchers then noted that it is not just time-on-task that is a critically important learning variable. In order to use time effectively, a student must experience a reasonable

rate of success in learning. If a student is making a great many errors in solving math problems, for example, he may be actively, but not productively, engaged in learning. Thus, a new variable labeled ALT -- for Academic Learning Time -- has been shown positively linked to achievement (Berliner, 1984).

"Academic" Learning Time may be misnamed because ironically, ALT is easier to monitor in vocational education than it is in many academic subjects. The performance measures typical of vocational education enable both students and teachers to know how much time is spent in productive learning, that is, time in which the student is actively and successfully engaged in the learning task. There is a learning zone for skills-oriented tasks in which the task should be sufficiently difficult to be challenging, but sufficiently easy to permit the learner to experience success from 70 to 80 percent of the time. If the task is too difficult, the learner becomes discouraged and disengaged; if it is too easy, there is no feeling of achievement, and the student becomes bored. Whenever the goal of the the learning can be defined as the mastery of some new skill, academic or vocational, setting the level of difficulty correctly is pedagogically important.

There is, however, a somewhat less skills-oriented meaning of "active learning" that is often more characteristic of academic learning than of vocational education. And that is the learning that comes from grappling with ideas. Today, the buzz word is "critical thinking," which is subject to a wide variety of interpretations, but always suggests active analysis on the part of the learner. No one can teach someone else by taking an idea or a concept and placing it, whole and unexamined, in the mind of the other. The teacher, warned Alfred North Whitehead (1929), must "beware of inert ideas -- that is to say, ideas that are merely received into the mind without being utilized, or tested, or thrown into fresh combination." Learning, for any of us, consists of taking an idea or a concept or a problem solution and making it our own by working it into our own knowledge and experience. An active mind is just that -- one that is actively engaged in examining, questioning, and relating new ideas to old.

Too often we speak carelessly about students learning "more"-- or about how "much" students know, as though learning were an additive process in which new learning is simply piled on top of the old. This is the empty vessel metaphor for learning. The teacher opens the lid and pours new information in on top of existing knowledge. Such learning is passive on the part of the student. Students receive information without acting upon it to make it their own. Passive learning is what is involved in the cynical definition of a college lecture hall as a place where information passes from the notes of the professor into the notebooks of the students without passing through the minds of either.

Learning, properly understood, is transformational rather than additive. New learning interacts with what we already know to transform and deepen our understanding. David Ausubel (1977), a pioneer in the study of meaningful learning, made the point more than 15 years ago, but it is receiving renewed attention today. He said, in essence, find out what a student knows and teach accordingly. That bit of wisdom is almost lost in the vocabulary of cognitive psychology, but we talk about "schemata" today as mental structures that store and organize learned material. One can picture a schema as a multi-dimensional map of interrelated ideas, with all sorts of connections among stored material. Learning is an active, dynamic **process** in which the connections are constantly changing and the structure reformatted.

The excitement of learning comes when new connections are made, sometimes transforming the structure, pulling apart some connections and making new ones. The point is that new information results in meaningful learning when it connects with what already exists in the mind of the learner.

Research on the difference between the learning of novices and experts shows clearly that for the expert, new information is quickly grasped in useable form because connections to existing knowledge are numerous. The learning of a novice, in contrast, is labored and slow, not because the novice is less intelligent than the expert or even less motivated, but because connections between new information and existing schemata are

sparse. There are no hooks on which to hang the new information. Thus, it falls in a heap on the floor, sorted and recalled only with great difficulty.

To illustrate the very simplest level the association between new learning and old, we might note the proliferation of 1-800 numbers. Call 1-800-WINDOWS to get information about new windows for your home, or call 1-800-GO BEARS for tickets to Cal football games. Not only are letters easier to remember than numbers because of the associations we have already formed, but the advertiser is tieing the particular word to the product sold. She is seeking to make maximum connections and therefore to increase the likelihood of recall and use.

All of this suggests one reason for today's emphasis on understanding cultural differences of increasingly diverse student populations. What do students already know, and how can new learning be framed to make meaningful connections? The more teachers can develop analogies and metaphors to relate to the backgrounds of students, the more likely new knowledge will become integrated into the schemata or knowledge structure that represents the student's understanding.

You may remember the scene in the movie, Stand and Deliver, in which the high school math teacher, Jaime Escalante, is trying to teach the concept of negative numbers to a rather hostile group of students from the barrio of East Los Angeles. Escalante says, "Negative numbers ...very important. You dig a hole in the sand and put the sand next to the hole. The hole, minus two. The sand, plus two. You see that?" he says to a group of students who have spent much of their young lives at the beach. "The hole is minus two. The pile of sand is plus two. What do you get if you add them back together?

This brief scene shows how the teacher has brought together knowledge of his subject matter and an understanding of his students to make valid connections between what the students already know and what he wants them to understand. It is why metaphor and analogy are so effective in teaching. They connect new information to familiar concepts.

Both vocational and academic education require active learning. Vocational educators have a natural advantage, however. While there is some danger of equating physical activity with mental activity, the two do tend to go together. Many of the aids that we use in learning abstract concepts are physical movements. Highlighting passages in the text book, for example, is a physical activity that most of us use to help us keep our mental activity concentrated on the target.

The natural advantage that most vocational education has over academic is that much of vocational education consists of problem solving, which is a form of active learning. Whether it is identifying a health problem or programming a computer, the student must be actively involved in finding the solution. In academic subjects such as sociology and literature, it is far more difficult to create a problem that will require active learning. Without special effort on the part of the teacher, students are likely to regard much academic subject matter as something to be memorized and "added to," i.e. "laid on top of" their current pile of learning. Problem-solving is by nature a dynamic, interactive, process and it is extremely valuable characteristic of vocational education. But only if it is recognized and used.

Even vocational education can be and --sad to say-- is taught with the teacher solving the problem and the students imitating the teacher. That is not preparation for lifelong learning nor even for the solution of tomorrow's problem.

I think of one final interpretation of active learning or involvement in learning, and that is the extremely important matter of motivation for learning. Motivated learners are active learners. Here again vocational education has a built-in advantage over academic learning in that students are likely to be motivated by the quite visible relevance of the subject matter, along with the presentation of real problems to be solved.

When Benjamin Bloom and his colleagues (1956) devised their taxonomy of cognitive skills, they gave "application" a higher position in the hierarchy than "knowledge" or "comprehension." Most vocational education has "application" as the

goal. In the hierarchy of cognitive skills, students need to "know" and "comprehend" before they can "apply." Unfortunately, much school learning stops at achieving the lower level skills of knowledge and comprehension. That is not to say that teachers **should** be content with testing students for recall and comprehension. It is rather to decry the tendency of teachers to be content with students giving back to the teacher information in much the same form as it was received. The pressure is on now, of course, to urge all teachers to press students to move toward the higher level skills of "analysis," "synthesis," and "evaluation," which involve active learning and transformation on the part of students. And that means teachers of vocational education too. Remember that while the vocational goal of application is a higher level skill than recall and comprehension, it is a lower level skill than analysis, synthesis, and evaluation. Vocational students, as well as academic students, should be able to **analyze**, which involves the ability to check hypotheses with given information and assumptions -- to **synthesize**, which means putting together elements to make something that was not visible before -- and to **evaluate**, which means the ability to make judgments about the effectiveness and use of something. The vocational curriculum itself presents ample opportunity for the development of higher level cognitive skills of analysis, synthesis, and evaluation, but narrow training for job skills fails to develop these lifelong learning skills.

Thus, the first critical condition of excellence is the active involvement of students in learning. The pedagogical pluses in vocational education are many, but vocational education teachers need to capitalize on their students' motivation and to see to it that students are developing lifelong learning skills through their active involvement in the process of learning.

Feedback:

Feedback is the second condition of excellence identified by the higher education Study Group. Given today's concern about assessment, I shall interpret feedback broadly, to mean feedback to students on their performance as learners, feedback to faculty on their

performance as teachers, and feedback to institutions and programs on their effectiveness as learning environments.

To date, most of the attention in the nationwide assessment movement is focused on the evaluation of programs and institutions. Such assessments provide feedback to administrators, legislators, and taxpayers, largely for accountability purposes. But if improvement of students' learning is the goal, then assessment has to take place at the more intimate level of the classroom--where teaching and learning actually take place.

For some five years now, with funding from the Ford Foundation and the Pew Charitable Trusts, I have been encouraging teachers to get more feedback on the impact of their teaching on students' learning via something that I call Classroom Research. Classroom Research consists of simple procedures used by teachers in their own classrooms to assess what students are learning while the class is still in progress. When I use the term "Classroom Research," I am not talking about research with a capital R to mean heavily-funded, discipline-based, publication-conscious, PhD-type research that typically takes teachers **out** of the classroom to do their research. Rather, I am using "research" in the simple dictionary definition of the term to mean, "careful, systematic, and patient study." Classroom Research is the careful, systematic, and patient study of students in the process of learning.

The question for Classroom Research is not the general question tackled by educational psychologists, How do students learn? -- but rather the specific question that should concern all teachers, What are **my** students learning in **my** classroom as a result of **my** instruction? A Classroom Researcher is interested in knowing what happens when a known group of students try to learn a particular lesson under the realistic conditions of the classroom. Classroom Research is the systematic study, by teachers in their own classrooms, of how students are responding to our efforts to teach them -- where "efforts to teach them" may include anything from lecturing, to correcting performance, to creating an environment for learning.

In one sense, Classroom Research is built into vocational education. The immediate goal of vocational education is develop the student's ability to perform a given procedure, which is usually observable, assessable, and indicative of whether students can apply their learning. That presents an advantage over academic learning where we usually have to assess what a student knows by a paper and pencil test, and we are then left wondering whether students can and will apply what they know. While it is fairly clear that students passing the performance measures in a course on auto mechanics can apply what they learn, it is not so clear that students passing a course in sociology will apply what they learn, even if they answer all of the questions on the written test correctly. Thus, once again, vocational educators have a pedagogical advantage in that obtaining useful feedback is a natural procedure in most vocational education.

There is a tradeoff, however. While vocational educators may be able to certify that students can perform a given task, the rub comes when it comes to the generalization of learning to other similar tasks or to the ultimate criterion of lifelong learning. Some performance goals may consist of the ability to copy what the instructor does or what the video shows, but in the long run, the aim of all education is to prepare students to generalize their learning and to be able to apply their skills across a range of situations.

The original purpose of Classroom Research was to provide feedback to teachers on what students were learning while there was still class time left in which to make corrections. In lecture classes, teachers usually rely on "body language" for feedback on whether students are even attending to what is being said; in discussion classes, the feedback comes primarily from just a few students, -- usually those most likely to be actively engaged in the lesson. Over the years, conscientious teachers have devised some rather creative ways to find out what is going on in the heads of students.

One early method was the "Schilling shoebox," so named for the teacher who asked junior-high students to place their answers to questions in a shoebox, and upon the command of "Everybody show," hold up their shoeboxes. Because the sides of the boxes

acted as screens, Schilling could see the answers but students were spared classmates' scorn for a poor answer (Connolly & Eisenberg, 1990)

More recently, I have seen lecturers pass out index cards to their audiences, asking people to hold up the red card if they were not following, a yellow card if they were confused, and a green card if they were with the lecturer all the way. Now, of course, we have the computerized classroom in which students at American University respond to teachers' questions by selecting the correct answer on their keypad, and then pressing "Send" upon the teacher's request, thus enabling the teacher to monitor learning, to foster discussion, and not so incidentally, to encourage the active engagement of all students in the class (Connolly & Eisenberg, 1990).

Giving feedback to the teacher is the major purpose of Classroom Research. The rationale is that if a teacher can monitor what students are learning, then the teacher can modify the lesson accordingly, continuously experimenting, modifying, and reassessing the results. But giving feedback to students is equally important. Feedback has been developed to a high level of sophistication in coaching. There is probably no learning situation where students are more eager to benefit from feedback than in sports. If a golfer wants to improve her swing, or a football team its defensive strategies, feedback is the essential tool for improvement. Coaches are eager to provide everything from their own careful analysis, to a computer simulation of the activity, to slow-motion, stop-action video to provide feedback on performance. Coaches and students go over the feedback in excruciating detail to analyze and evaluate performance with the serious intention of improving it. Coaches, by and large, are not interested in minimal standards; they are interested in excellence, and feedback is the route to improvement.

In academic and vocational education, we have to be more inventive than we have been in the past about getting feedback to both students and teachers. In an effort to get college teachers started on Classroom Research, my colleague, Tom Angelo, and I prepared a handbook of 30 simple Classroom Assessment Techniques which require no

background in education or the psychology of learning (Cross & Angelo, 1988). The purpose of the techniques is to assess what students already know, what gets added during a class session or as a result of an assignment, and what kind of connections students make between new learning and old. In the best of all possible worlds, Classroom Research provides the challenge for continuous experimentation on how teaching can be changed to make a greater impact on learning.

Let me give one simple example of Classroom Research to make the concept concrete. My personal favorite among the assessment techniques we describe in the Handbook is one of the easiest to administer, yet it provides very rich and useful data. It is called "Minute Papers," and was originally proposed by Charles Schwartz, a professor of physics at the University of California, Berkeley. A few minutes before the end of class, he asks students to write the answer to two questions 1) What was the most important thing you learned today? and 2) What questions are uppermost in your mind as we conclude this class session?

I have used Minute Papers in my own graduate classes at Harvard and at Berkeley. Inevitably, I find that the first time I use Minute Papers in class, some students are hard-put to articulate anything of importance that they learned in the class session, and much to my dismay and disappointment, they seize desperately on the last thing said. Some students pick up something that I thought was fairly incidental, but that had particular meaning for them; it made some connections with what they already knew. Some, to my delight, choose as most significant, something that they learned, not about content, but about themselves as learners. A few students synthesize beautifully, picking up the major themes and articulating them clearly, and then raising some rather interesting questions.

I find that Minute Papers are good teaching techniques as well as useful feedback devices. Even among graduate students, Minute Papers done early in the semester tend to bring forth fairly low-level cognitive learning. Some students, for example, cite specific facts or content that they deem significant. As the semester progresses and I feed back to

students the responses of classmates, students who formerly thought largely in terms of facts, begin to model the higher stages of cognitive learning shown by some of their classmates. They begin to look for broader principles and concepts and to articulate those as among their most significant learnings.

In addition to providing information about what students are learning while there is still time to make mid-course corrections, the simple device of Minute Papers carries some strong pedagogical messages. It puts students on notice that they are expected to be able to synthesize and articulate their learning; and they are expected to be active learners, raising questions and thinking about implications. The requirement to think about the most significant thing you learned requires an active stance toward learning.

I have also found that opening a class session with a review of what students, as a group, found most significant from the previous class session builds a nice bridge of continuity from one class to the next, and it also gives me an opportunity to prepare handouts or otherwise clarify issues that students found puzzling or provocative. Most importantly, perhaps, it provides feedback to students, individually and collectively, on what they are learning and how it relates to the goals we have for the class.

Let me give a second example of Classroom Research. This project was reported by a teacher of accounting who was trying to address this familiar complaint:

> "My students show no interest in learning the fundamental principles of accounting. They cram for exams by memorizing disconnected facts and problem-solving 'recipes,' but they fail to grasp concepts that connect all that information. As a resuslt, within days after the test, they forget nearly everything they've struggled so hard to learn." [Cottell, 1991 #2]

He, therefore, went to the Handbook and adapted for his purposes the Classroom Assessment Technique (CAT) called Self-Diagnostic Learning Logs [Cross, 1988, pp. 120-123 #3] His assignment to students read as follows:

1. The purpose of the learning logs is to enhance your ability to learn accounting concepts and principles. On each day that cases are due, students will also hand in a one-page learning log report...

2. The learning log should answer the following questions:

A. Which accounting concept or principle that you learned from the lecture or from studying the current chapter was useful ot you in working the current case?

B. Which accounting concept that you have previously learned did this new concept or principle build on?

C. If you experienced difficulty ...what information or knowledge would have enhanced your ability to work it?..."[Cottell, 1991, p. 47 #2]

In this instance, the teacher is using Classroom Research, not as much to provide feedback, as to focus attention on the kind of learning that he wants students to engage in. Both Minute Papers and Self-Diagnostic Learning Logs require students to engage in the higher-level learning activities of synthesis, application, and evaluation.

High Expectations:

Finally, I want to say a few words about the third critical condition for excellence identified by the Study Group -- high expectations. Education at all levels is probably critized more for its lack of standards and high expectations than for any other single shortcoming. The litany of our failure as educators to expect students to work hard at the business of learning is familiar to all of us. Students aren't assigned homework; we don't require them to engage in the active and demanding task of writing papers; we talk about excellence, but we barely expect adequacy.

Some vocational educators have a pedagogical plus in the form of external licensing procedures which set minimal standards, if not high expectations. Doctors, lawyers, nurses, accountants, and a host of other vocations -- but not college teachers -- must meet standards that are agreed upon by the profession before they are permitted to practice. And this is also true of a few vocational specialties -- which is more than can be said for

associate, bachelor's, and even master's and doctor's degrees. But the problem at all levels and across all curricula is that our expectations are so low. Students themselves are far more likely to say that we expect too little than that we expect too much.

A plus that is shared by many vocational educators lies in vocational education's use of advisory committees, which when used well, provides an outside check on the quality of student performance. Unfortunately, advisory committees are not always used well. Sometimes they are mere window dressing for the legitimacy of the program. Sometimes they serve simply as an audience for a report on the status of the program. Advisory committees should be used to advise, not only on the design of up-to-date courses and curricula, but also on the collection of data from employers on how well graduates perform on the job. Some confident community colleges are beginning to offer "guarantees" with their graduates; if the graduate cannot perform up to the expectations of either the employer or the graduate, the college will provide further education free of charge, hopefully enabling the student to meet higher expectations.

Vocational education, along with practically every other form of education, has been criticized for low standards with respect to preparing students for their futures as lifelong learners. In education, as in almost every other endeavor, we will get about what we expect. We can well afford to expect more.

These then are the "pedagogical pluses" of vocational education. They are not insignificant. I believe that vocational educators should capitalize on them by taking full advantage of them in teaching, of course, but also in articulating an understanding of the learning process to faculty colleagues, administrators, and legislators. In these times of search for the assessment of student learning outcomes, vocational eduacation offers an unusual window through which to view the process of active involvement in learning.

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